

## REMARKS

In the patent application, claims 1-7, 9-17, 19-34 and 36 are pending. In the final office action, all pending claims are rejected.

At section 2 of the office action, claims 1-7, 9-17 and 19-34 and 36 are rejected under 35 U.S.C. 102(e) as being anticipated by *Ravi et al.* (U.S. Patent No. 6,292,834, hereafter referred to as *Ravi*) and *Wang et al.* (U.S. Patent No. 5,903,673, hereafter referred to as *Wang*)

The Examiner states that *Ravi* teaches a method for multimedia streaming as claimed in claim 1.

It is respectfully submitted that claim 1 includes the limitations of

1) defining in a client in a multimedia streaming network at least one parameter for determining a rate adaptation operating range, wherein the streaming network comprises a server configured for providing streaming data to the client, the client having a receiver buffer for storing at least part of the streaming data to compensate for a difference between data transmission amount by the server and usage amount of the streaming data by the client so as to allow the client to have sufficient amount of streaming data to play out in a non-disruptive manner, and wherein the rate adaption operating range is used for rate adaptation between the server and the client;

2) providing to the server information indicative of said at least one parameter;

3) adapting in the server the data amount to a reception rate at the client based on said at least one parameter, and

4) adjusting in the client packet transfer delay variation based on said adapting, wherein the one parameter comprises a shift amount in time indicative of a difference between a sampling time and a transmission time of a packet at the server (as disclosed in *Wang*).

In rejecting claim 1, the Examiner points to column 6, lines 33-47; column 7, lines 16-25 and column 8, lines 26-45 to show that *Ravi* discloses adapting in the server the data amount to a reception rate at the client based on said at least one parameter. The Examiner further points to col.10, lines 1-67 of *Wang* to show that *Ravi*, by incorporation by reference, discloses transmitting a frame based on network condition, and adjusting the cumulative bandwidth

balance according to the size of the current frame. In particular, the second loop rate control 204 adds to the cumulative bandwidth and the current frame and subtract from the cumulative bandwidth balance the amount of bandwidth time consumed by the current frame. Thus, *Ravi* discloses the difference between a sampling time and transmission time of a packet at the server.

It is respectfully submitted that *Wang* is concerned with adjusting the quantization parameter *Q* 114, which represents a selected comprise between signal resolution in the encoded video signal and the degree of compression realized in encoding video signal (col.7, lines 43-50). *Wang* discloses using a *Q* adjuster 116 to adjust the *Q* 114 based on the output of the primary open loop rate control 202 and the output of the secondary closed loop rate control 204 (Figure 2; col.9, lines 33-43).

In col.10, lines 21-59, *Wang* discloses:

*In test step 410, secondary closed loop rate control 204 determines whether the cumulative bandwidth balance is greater than the upper threshold of the range determined in step 404. If the cumulative bandwidth balance is within the desired range, processing transfers to test step 414 which is described more completely below. Conversely, if the cumulative bandwidth balance is greater than the desired range, excess bandwidth is accumulating and processing transfers to step 412 in which secondary closed loop rate control 204 decreases *Q* 114. Accordingly, video image quality is increased at the expense of increased bandwidth consumed by subsequent frames. This is appropriate since unused accumulating bandwidth is detected and using such bandwidth improves the overall perceived quality of the motion video image. In one embodiment, *Q* 114 is adjusted 1% for every 3% of the upper threshold that is exceeded by the cumulative bandwidth buffer. After step 412, processing of the current frame by secondary closed loop rate control 204 completes.*

*In test step 414, secondary closed loop rate control 204 determines whether the cumulative bandwidth balance is less than the lower threshold of the desired range determined in step 404. If the cumulative bandwidth is within the desired range, processing of the current frame by secondary closed loop rate control 204 completes. Conversely, if the cumulative bandwidth balance is below the desired range, bandwidth is*

*being consumed at too great a rate and processing transfers to step 416 in which secondary closed loop rate control 204 increases  $Q$  114. Accordingly, image quality is sacrificed to conserve bandwidth used by subsequent frames. Therefore, small excesses in consumed bandwidth which are undetected by primary open loop rate control 202 but which accumulate over time are detected by secondary closed loop rate control 204 and available bandwidth is not exceeded. In one embodiment,  $Q$  114 is adjusted 1% for every 3% of the lower threshold that exceeds the cumulative bandwidth buffer. After step 416, processing of the current frame by secondary closed loop rate control 204 completes.*

The quantization parameter  $Q$  used in encoding will affect the amount of encoded data of a frame and, therefore, the cumulative data amount to be transmitted. However, adjusting the cumulative data amount to be transmitted is different from changing the sampling time. A sampling time is when the packet is started to be sampled relative to when the packet is started to be transmitted, for example. The sampling time can be moved up or delayed relative to the transmission time without changing the encoding resolution or  $Q$ . Likewise, the cumulative data amount of the packet can be decreased by reducing the quantization parameter  $Q$  without changing the sampling time.

*Ravi* and *Wang* fails to disclose adjusting a shift amount in time indicative of a difference between a sampling time and a transmission time of a packet at the server. *Ravi* and *Wang* fails to disclose adapting in the server the data amount to a reception rate at the client based on said at least one parameter, and adjusting in the client packet transfer delay variation based on said adapting, wherein the one parameter comprises a shift amount in time indicative of a difference between a sampling time and a transmission time of a packet at the server.

For the above reasons, *Ravi* and *Wang* fails to anticipate claim 1.

In rejecting claims 2 and 3, the Examiner further states that *Ravi* discloses a minimum shift amount (decrease bandwidth threshold 512, column 7, lines 35-45; *Wang*, col. 10, lines 1-20) and a target shift amount (delta playtime and shift amount, column 8, lines 36-65).

Applicant respectfully disagrees.

At column 7, lines 16 to 25, *Ravi* discloses:

*FIGS. 5A, 5B, 5C, 5D and 5E, are detailed flowcharts illustrating steps 410, 420, 430, 440 and 450, respectively, of FIG. 4. In step 410, the performance variables are computed. Next, in step 420, the computed performance variables are used to determine if it is desirable to decrease the bandwidth, and if so, then in step 430, the bandwidth is decreased. If a bandwidth decrease is not desirable, then in step 440, the performance variables are used to determine if it is desirable to increase the bandwidth. If a bandwidth increase is desirable, then in step 450, the bandwidth is increased.*

In the above paragraph, *Ravi* discloses the client computer 240 computes the performance variable (step 410), including computing playtime and delta\_playtime (step 513); decreasing the bandwidth (step 430) and sending a reduce\_bandwidth message to the server (step 537); or increasing the bandwidth (step 450) and sending an increase\_bandwidth message to the server (step 522). According to *Ravi*, the term “bandwidth” is synonymous to the “transmission rate” (column 6, line 63 to column 7, line 5).

At column 7, lines 35-45, *Ravi* discloses:

*FIGS. 6A and 6B are two halves of a flowchart illustrating the dynamic determination of the Upper INC\_BW threshold and the DEC\_BW threshold, step 512 in greater detail. In step 612, the difference (D1) between the Current\_Time and the previous time the dynamic bandwidth selection method was invoked is computed. In step 614, the difference (D2) between the timestamp of the last data packet currently in playout buffer 366 and the timestamp of the last data packet in playout buffer 366 during the previous invocation of the Adjust\_Bandwidth procedure, is computed. In step 616, the difference (D3) between the number of bytes received by the previous invocation and the number of bytes currently received (by the current invocation) is computed.*

As pointed out above, *Wang* only discloses adjusting the quantization parameter Q 114 in order to adjust the cumulative data amount to be transmitted.

At column 8, lines 26 to 65, *Ravi* discloses:

*FIG. 7A is a flowchart illustrating the computation of variables Playtime and Delta\_Playtime, step 513, in greater detail. In step 710, Playtime is set to the Duetime of the last packet in playout buffer 366. The computation of the Duetime is described in greater detail in step 740 below. Client computer 240 determines the change in the Playout\_Buffer\_Size (step 720). The Delta\_Playtime is set to the difference between the current Playtime and the Playtime at the previous invocation of the Adjust\_Bandwidth procedure (step 730). Variables Playtime and Delta Playtime provide exemplary absolute and relative measures, respectively, of the Playout\_Buffer\_Size, the number of data packet(s) in playout buffer 366.*

*FIG. 7B illustrate the determination of the Duetime of a data packet (step 710). First, the Base\_TS is set to the timestamp of the first packet received by client computer 240 (step 712). The Base\_Time is set to the time when the first packet was received (step 716). The TS is set the timestamp of the data packet of interest (step 746).*

In the above paragraphs, *Ravi* only discloses how the client computer 240 computes the Playtime and Delta Playtime (step 513, Figures 5a and 7a)

*Ravi* and *Wang* fails to disclose that the shift amount is substantially equal to or greater than the difference. Thus, *Ravi* and *Wang* fails to anticipate claims 2 and 3.

Furthermore, claims 2 and 3 are dependent from claim 1 and include further limitations. For reasons regarding claim 1 above, claims 2 and 3 are distinguishable over the cited *Ravi* and *Wang* references.

As for claims 4, 5 and 9, they are dependent from claim 1 and include further limitations. For reasons regarding claim 1 above, claims 4, 5 and 9 are also distinguishable over the cited *Ravi* and *Wang* references.

For reasons regarding claim 1 above, *Ravi* also fails to anticipate independent claims 11, 21 and 26, and dependent claims 12-15, 17, 19, 20, 22-24 and 27-31.

At section 4, claims 6-7, 10, 16, 25 and 32-34 are rejected under 35 U.S.C. 103(a) as being unpatentable over *Ravi*, in view of *Nilsson et al.* (U.S. Patent Application Publication No. 2005/0172028, hereafter referred to as *Nilsson*).

In rejecting claim 6, the Examiner states that *Ravi* fails to disclose that the parameter comprises a shift amount in time indicative clock shift between the server and the client, but points to *Nilsson* for disclose such feature (paragraphs [0133]-[0134]).

It is respectfully submitted that *Nilsson* only discloses that, to determine the exact amount of data in the client's buffer, the server also needs to know the timestamp of the data packet that the client is currently decoding under the assumption that the client's clock does not drift significantly from the server's clock (paragraph [0133]). In the rare case of a large amount of drift accumulating, the client can warn the server by use of a control message, such as the one described earlier that is sent for decoding buffer underflow (paragraph [0134]). According to *Nilsson*, in case of decoding buffer underflow, the server is notified of the buffer underflow so that the server will send packets as quickly as possible (paragraph [0126]-[0127]).

However, *Nilsson* fails to disclose that the client sends to the server a parameter indicative of a shift amount in time indicative of a clock drift between the server and the client.

For the above reasons, *Ravi*, in view of *Nilsson*, fails to anticipate independent claim 6.

For the same reasons, *Ravi*, in view of *Nilsson*, fails to anticipate independent claim 32 and dependent claims 7, 10, 16, 25 and 33-34.

CONCLUSION

Claims 1-7, 9-17, 19-34 and 36 are allowable. Early allowance of all pending claims is earnestly solicited.

Respectfully submitted,



Kenneth Q. Lao  
Registration No. 40,061

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WARE, FRESSOLA, VAN DER SLUYS  
& ADOLPHSON LLP  
Bradford Green, Building 5  
755 Main Street, PO Box 224  
Monroe, CT 06468  
(203) 261-1234